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LEGUME HAYS *for* MILK PRODUCTION



AN ABUNDANCE of home-grown legume hay establishes a basis for an economical dairy ration.

Legumes are superior to other hays in palatability, in quantity and quality of the proteins furnished, and in content of lime. As a class they yield more nutrients per acre than do nonlegumes, and protein is obtained at a lower cost.

In spite of these facts, only 41 per cent of the hay grown in the United States is legume hay. In the North Central and North Atlantic States, which contain 66 per cent of all the dairy cows, the farmers grow 2 tons of nonlegume to 1 ton of legume hay.

Leafy, small-stemmed hay, cut before it is too mature and properly cured without being rained on is best.

Alfalfa hay is considered best for dairy cows, followed closely by clover and the annual legumes, such as soy beans and cowpeas.

LEGUME HAYS FOR MILK PRODUCTION

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LEGUMES LONG KNOWN TO MANKIND

THE LEGUMES are among the oldest plants known to mankind. Their superior feeding qualities and great value as forage crops were recognized as early as the first century. At that time Colu-



FIG. 1.—Raking alfalfa hay with side-delivery rake

mella, an early Roman agricultural writer, stated: "The best forage plants are alfalfa, fenugreek, and vetches. Alfalfa may be placed in the foremost rank of such plants; for when once sown it lasts 10 years, fattens lean cattle, and has a salutary action on sick cattle."

In spite of the fact that Columella had the right idea nearly 2,000 years ago and that his recommendations have been uniformly confirmed and reconfirmed by all the careful hay investigations that have been carried out since, only 41 per cent of the hay grown in the United States at present is legume hay. Furthermore, in the North

Central and North Atlantic States, which contain 66 per cent of all the dairy cows in the country, the farmers grow 2 tons of nonlegume hay to 1 of legume hay.

COMPARISON OF LEGUME HAYS AND TIMOTHY IN YIELD OF PROTEIN AND OTHER NUTRIENTS

Table 1 shows that the legume hays, alfalfa and clover, produce more hay per acre than does timothy. Alfalfa averaged 2.79 tons of hay per acre during 1927; clover, 1.75 tons per acre; whereas timothy yielded only 1.43 tons per acre. An acre of average alfalfa hay in 1927 produced almost 7 times as much digestible protein, over twice as much total digestible nutrients, and 15 times as much lime as did timothy. In other words, it required approximately 7 acres of timothy hay to produce as much digestible crude protein as 1 acre of alfalfa. Fifteen acres of timothy would have to be grown, harvested, and fed to produce as much lime as 1 acre of alfalfa.

TABLE 1.—Average yield per acre of various hays for the year 1927 and quantity of nutrients produced per acre

Hay	Average yield per acre ¹	Digestible crude protein ²	Total digestible nutrients ²	Lime (CaO), ³
	Pounds	Pounds	Pounds	Pounds
Alfalfa.....	5,580	591	2,879	108.81
Clover.....	3,500	266	1,781	56.00
Timothy.....	2,860	86	1,387	7.15
Soy bean ³	2,180	255	1,168	37.49
Cowpea ³	2,180	285	1,068	55.37

¹ Average yields as reported by Bureau of Agricultural Economics, U. S. Department of Agriculture.

² Figures taken from Henry and Morrison, Feeds and Feeding.

³ Yields reported as annual legumes, including soy beans, cowpeas, velvet beans, and peanut vines.

One acre of clover hay produced three times as much digestible protein as 1 acre of timothy hay and as much lime as 7.8 acres of timothy. The annual legumes, cowpeas, and soy beans, are almost equal to the clovers in the quantity of nutrients and lime produced. Where it does well, alfalfa hay is far superior to the other legumes, both as to yield and the quantity of nutrients produced per acre.

Dairy cows build their bodies and produce milk from the nutrients they obtain from their feed. It is a well-established principle of correct feeding that the roughage should have first consideration in planning a ration. The roughage that produces the most and the best nutrients per acre should be grown. The legume hays as a class, and especially alfalfa, yield more nutrients per acre than does timothy.

PROTEIN OBTAINED AT LOW COST THROUGH HOME-GROWN LEGUMES

Concentrates containing large quantities of protein are added to dairy-cow rations primarily to supply protein in which the farm-grown cereal grains and nonleguminous roughages are deficient. These high-protein concentrates usually must be purchased, in which case the cost per 100 pounds of digestible protein is usually higher

than if a portion of this digestible protein were raised on the farm in the form of legume hays. Table 2 illustrates this point.

TABLE 2.—*Cost per 100 pounds of digestible protein*

Feed	Price per ton	Cost per 100 pounds crude digestible protein
Alfalfa hay ¹	\$12.02	\$5.66
Timothy hay ¹	11.31	18.85
Clover hay ¹	11.91	7.83
Linseed meal ²	47.45	7.85
Cottonseed meal (43 per cent).....	49.60	7.42

¹ Estimated price received by producers Dec. 15, 1927, as reported by Bureau of Agricultural Economics, U. S. Department of Agriculture, January, 1928.

² Monthly average price, December, 1927, Minneapolis.

From this table it is seen that at the prices listed 100 pounds of crude digestible protein in alfalfa hay costs \$5.66, whereas from



FIG. 2.—Curing alfalfa hay under canvas caps

timothy hay the same amount of digestible protein costs \$18.85. It would take approximately 3.5 tons of timothy hay costing \$39.58 to furnish as much protein as 1 ton of alfalfa hay costing only \$12. Even when compared with the high-protein concentrates, such as linseed meal and cottonseed meal, alfalfa compares favorably in cost per 100 pounds of crude digestible protein at the prices given.

If dairymen would grow and feed more protein in the form of legume hays, their feed bills would be reduced materially. An abundance of home-grown legume hay establishes a basis for an economical ration.

LEGUMES SUPERIOR IN PALATABILITY, IN QUALITY OF PROTEIN, AND IN CONTENT OF LIME

In addition to furnishing more milk-making nutrients at cheaper cost, the legumes are far superior to the nonlegumes in palatability. They are also superior in the quality of their protein and in the content of lime. The essential amino acids of the protein in legume hays supplement to good advantage the deficiency of amino acids in the cereal grains and silage.

As was previously pointed out, properly cured legume hays are much richer in lime than the nonlegume hays; alfalfa produces approximately 15 times as much lime per acre as does timothy. Experimental evidence shows that dairy cows, to produce at their best, must have a sufficient supply of available lime in their feed. Practically all the concentrates and the nonlegume hays are deficient in

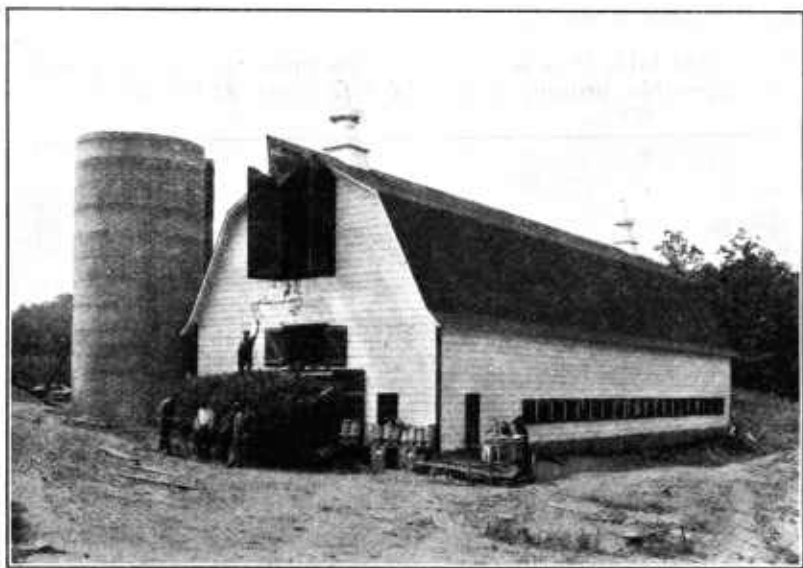


FIG. 3.—Putting legume hay in barn.

lime. The best way, therefore, to furnish a sufficient quantity of lime to dairy cows is to grow and to feed legume hays.

WHICH LEGUMES ARE BEST?

There are many legumes which can be adapted to as many different conditions. Therefore, as a general rule, the legume that can be most practically produced on a given farm is the one that should receive first consideration.

Leafy, small-stemmed hay, cut before it is too mature, and properly cured without being rained on is best. In this condition it is most palatable and will contain a maximum quantity of its natural green color.

On account of its high protein and calcium content, its palatability, and greater yield per acre, alfalfa is considered the best legume hay for cows. In some irrigated sections of the West, where the alfalfa is

low in price and of high quality, many dairy herds are profitably fed largely on alfalfa hay alone.

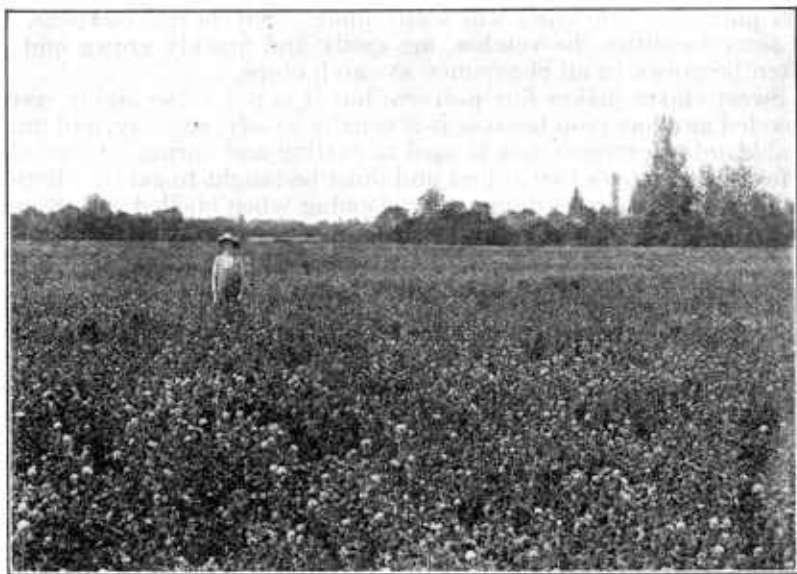


FIG. 4.—A field of red clover ready to cut for hay

All the clovers make good hay if cut at the proper stage and cured well. Most dairymen consider that clover hay is not quite equal in



FIG. 5.—Soy beans being grown for hay

feeding value to alfalfa but that it is a close second. However, clover hay is more easily grown in some sections than alfalfa. Where this is the case clover may prove more practical.

The annual legumes, such as soy beans and cowpeas, are well liked by cows and furnish about the same amount of protein per ton as does alfalfa. As a rule, however, the stems are coarser, making them less palatable, and cows will waste more. Soy beans, cowpeas, and in some localities the vetches, are easily and quickly grown and can often be grown in an emergency as catch crops.

Sweet clover makes fine pasture; but it is not to be highly recommended as a hay crop because it is usually woody, stemmy, and unpalatable unless extreme care is used in cutting and curing. Cows often refuse sweet-clover hay at first and must be taught to eat it. Reports indicate that there is danger of poisoning when spoiled sweet-clover hay is fed.

FEEDING TRIALS

Experimental feeding trials where legume hays have been compared with the nonlegumes for milk production have invariably shown that the legumes produce more milk at less feed cost. Not only are the legumes efficient as milk producers, but they are almost indispensable in the proper feeding of dairy heifers. Their palatability and high protein and lime content make them especially valuable for growing animals.

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